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| APPLICATION NO.                              | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|--|-------------|----------------------|---------------------|------------------|
| 10/711,239                                   | 09/03/2004  | Hari Hariharan       | GEMS8081.228        | 5238             |
| 27061  | 7590        | 03/22/2006           | EXAMINER            |                  |
| ZIOLKOWSKI PATENT SOLUTIONS GROUP, SC (GEMS) |             |                      |                     | VAUGHN, MEGANN E |
| 14135 NORTH CEDARBURG ROAD                   |             |                      |                     | ART UNIT         |
| MEQUON, WI 53097                             |             |                      |                     | PAPER NUMBER     |
|  |             |                      |                     | 2859             |

DATE MAILED: 03/22/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

|                              |                        |                     |
|------------------------------|------------------------|---------------------|
| <b>Office Action Summary</b> | <b>Application No.</b> | <b>Applicant(s)</b> |
|                              | 10/711,239             | HARIHARAN ET AL.    |
|                              | <b>Examiner</b>        | <b>Art Unit</b>     |
|                              | Megann E. Vaughn       | 2859                |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on 9/3/2004.
- 2a) This action is FINAL.                            2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 1-20 is/are pending in the application.
  - 4a) Of the above claim(s) 9-20 is/are withdrawn from consideration.
- 5) Claim(s) \_\_\_\_\_ is/are allowed.
- 6) Claim(s) 1-8 is/are rejected.
- 7) Claim(s) \_\_\_\_\_ is/are objected to.
- 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on 9/3/2004 is/are: a) accepted or b) objected to by the Examiner.
 

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) All    b) Some \* c) None of:
    1. Certified copies of the priority documents have been received.
    2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

|   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | Paper No(s)/Mail Date _____   |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
|   | 6) <input type="checkbox"/> Other: _____                                    |

**DETAILED ACTION**

***Election/Restrictions***

1. Applicant's election with traverse of Invention I in the reply filed on 2/15/2006 is acknowledged. The traversal is on the ground(s) that the Examiner's example fails to provide a reasonable example that recites a material difference. This is not found persuasive because the material difference is the fact that claim 1 does not require setting the target amplitude equal to the maximum echo amplitude. Thus, a reference that may read on claim 1 may not read on claims 9 and 15.

The requirement is still deemed proper and is therefore made FINAL.

***Specification***

2. The disclosure is objected to because of the following informalities: On pages 8 and 9, reference numeral 90 referring to Figure 3, should be 96.

Appropriate correction is required.

***Drawings***

3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character "96" has been used to designate both "the end" in figure 2 and the curve in figure 3. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being

Art Unit: 2859

amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Claim Rejections - 35 USC § 102***

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-5 are rejected under 35 U.S.C. 102(b) as being anticipated by LeRoux et al (US 5345176).

5. With respect to claim 1, LeRoux et al discloses in figure 1, an MRI apparatus comprising: a magnetic resonance imaging (MRI) system having a plurality of gradient coils (136) positioned about a bore of a magnet (146) to impress a polarizing magnetic field and an RF transceiver system (122) and an RF switch controlled by a pulse module (120) to transmit RF signals to an RF coil assembly (138) to acquire MR images; and

    a computer (100) programmed to determine, in real-time, a respective flip angle for each data acquisition pulse of a pulse sequence (column 9, lines 1-10) for multi-echo acquisition of MR data matched to a given target tissue and a given scan prescription to reduce ringing artifacts from amplitude decay of the multi- echo acquisition (column 1, lines 13-18).

With respect to claim 2, LeRoux et al discloses the computer is further programmed to determine the respective flip angle for each data acquisition pulse to maintain cumulative RF deposition during data acquisition within a prescribed level (column 9, lines 39-41).

With respect to claim 3, LeRoux et al discloses the computer is further programmed to determine the respective flip angle from a selection of one of a number of stored polynomial expressions of available flip angle trains, the selected polynomial expression being most optimal of the number of stored polynomial expressions for the given target tissue and the given scan prescription (column 8, lines 30-60).

With respect to claim 4, LeRoux discloses the MRI apparatus of claim 3 wherein the computer is further programmed to determine a most optimal polynomial expression from a target amplitude desired for a majority of echoes of the multi-echo acquisition (column 8, lines 61-63).

With respect to claim 5, LeRoux discloses the MRI apparatus of claim 3 wherein the computer is further programmed to determine a flip angle train for the pulse sequence from the number of stored polynomial expressions (column 8, lines 30-60) that will provide a less noisy image (column 1, lines 13-18) of the target tissue.

#### ***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over LeRoux et al (US 5345176) in view of Loncar et al (US 6252400).

LeRoux et al discloses the MRI apparatus and computer programmed to determine the flip angle as discussed above in paragraph 5.

LeRoux et al does not specify the magnetic field strength used.

Loncar et al discloses an MRI apparatus with a magnetic field strength of 1.5 Tesla. Therefore it would have been obvious to a person having ordinary skill in the art at the time that the invention was made to use a magnetic field of 1.5 Tesla as taught by Loncar et al because 1.5 T is a common magnetic field setting in MRI and at 1.5 T hydrogen dipoles have a well known resonance strength of approximately 64 MHz, and because of the abundance of hydrogen and its strong signal most typical MRI apparatuses are tuned to the resonant frequency for hydrogen (column 1, lines 47-53).

8. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over LeRoux et al (US 5345176) in view of Alsop's The Sensitivity of Low Flip Angle RARE Imaging.

With respect to claim 7, LeRoux et al discloses the MRI apparatus and method wherein the computer is further programmed to determine the respective flip angle for each data acquisition pulse (column 9, 1-12).

LeRoux et al does not disclose specifically that the flip angles are determined based on T1 and T2 characteristics of the given tissue.

Alsop discloses that the relationship between T1, T2, flip angle, and echo amplitude (page 179). Therefore it would have been obvious to a person having ordinary skill in the art at the time that the invention was made to use the equation using T1 and T2 values to calculate the flip angle because it makes the calculation more specific to the type of tissue being imaged due to the fact that T1 and T2 are different for every tissue.

9. Claim 8 is rejected under 335 U.S.C. 103(a) as being unpatentable over LeRoux et al (US 5345176) in view of Stuber et al (US 6230039).

With respect to claim 8, LeRoux et al discloses the MRI apparatus wherein the computer is programmed to acquire data with a fast spin echo pulse sequence (column 1, lines 13-18).

LeRoux et al does not disclose specifically that his apparatus can acquire 2D or 3D data.

Stuber et al discloses the methods and the software wherein the computer is programmed to acquire 2D or 3D MR data (column 3, lines 34-36). Therefore it would have been obvious to a person having ordinary skill in the art the time that the invention was made to program the computer to acquire both 2D and 3D images in order to enable the user to either use a single stepped gradient along a single direction or two stepped gradients along two orthogonal directions as taught by Stuber et al (column 3, lines 33-41), to acquire the best image (2D or 3D) for the specific tissue.

***Conclusion***

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: McKinnon et al (US 6570383) discloses a method and apparatus for a pulse sequence for magnetic resonance imaging in an inhomogeneous magnetic field, Reiderman et al (US 6163153) discloses reducing the flip angle, Alsop (US 6489766), and Hennig (US 6850063).

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Megann E. Vaughn whose telephone number is 571-272-8927. The examiner can normally be reached on 8 am- 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez can be reached on 571-272-2245. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MV  
1/9/2006

  
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